

NASA TECH BRIEF



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Effects of High-Pressure Hydrogen on Storage Vessel Materials

It has been common knowledge for some time that the absorption of hydrogen by steel during certain industrial processes severely embrittles the steel. Prior tests have demonstrated that notched steel specimens exposed to high-pressure hydrogen have shown a marked decrease in fracture-resistant strength.

Because of the limited information available on the reaction of pressure-vessel steels in a high-pressure environment, a test program was initiated. Tensile tests were performed on specimens taken from welded plates of three grades of steel: A-302-56, Gr. B, modified with nickel; A-212-61T, Gr. B-FB; and A-517-64 Gr. F (T-1). The report details the chemical analysis and heat treatment of the test samples.

The welded plate samples were inspected by ultrasonic and radiographic methods. The results indicated an appreciable decrease of tensile strength and ductility of notched specimens and a decrease in ductility of unnotched samples. Surface cracking was evident in the unnotched specimens and apparently this cracking is conducive to the breakdown in tensile strength and ductility.

The results of this test program indicate the importance of thorough quality-control measures to

detect surface flaws and a continuing inspection program on hydrogen-containing pressure vessels in service.

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single Document price \$3.00
(or microfiche \$0.65)

Reference: NASA CR-85505 (X67-18178),
Effects of High Pressure Hydrogen on
Storage Vessel Materials

Patent status:

No patent action is contemplated by NASA.

Source: Robert J. Walter and Willis T. Chandler of
North American Rockwell Corporation
under contract to
Marshall Space Flight Center
(MFS-18605)

Category 03